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Osteopathic principles: More harm than good?

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Abstract Evidence-based clinical guidelines attempt to guide the decisions and behaviour of clinicians using recommendation statements. In contrast, the osteopathic profession has opted for a more fundamental set of guiding principles, which are intended to be true for all health problems, across all people, under all circumstances, for all time. This is a laudable, hugely ambitious challenge, ideally requiring the continued aggregation and synthesis of all knowledge of the human body. As this is virtually impossible and because future knowledge cannot be entirely predicted, it is argued that each principle must be considered a hypothesis that gradually advances closer to the truth as knowledge grows, using the scientific method.

Unsound principles may be harmful for the reputation of the profession (encouraging adherence to false dogma), and could result in poor decisions and ultimately poor care for patients. Hence, care must be taken during the formation of such potentially influential statements. This paper appraises the three 'sets' of consensus-borne osteopathic principles published over the last century. The strengths and deficiencies of themes running across these are highlighted and suggestions for future revisions are made.

Introduction

Discovering nature's secrets is not an easy task. One must first observe natural patterns so that hypotheses or conjectures may be formed and these must then be tested. However, absolute proof is gained only in mathematics. In comparison, an experiment relies on empirical observation and is therefore limited to estimating the probability of a result being true. Furthermore, mathematical proof is true everywhere in the universe, whereas the result of an experiment is valid only in the specific circumstances and location in which the observations were made. Nonetheless, through observations of multiple environments under varying circumstances, occasionally physical scientists manage to assemble such a mutually supporting mass of evidence that fundamental, immutable statements (or 'laws', such as those of thermodynamics) may be written.

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In healthcare, the idea that there are principles borne from discovered truths, to which the otherwise uncertain clinician should turn to guide practice, is an attractive one. A modern attempt to guide decisions and behaviour of clinicians comes in the form of the recommendation statements contained within evidence-based clinical guidelines.[1] These recommendations are based upon, and linked to, results from empirical research (usually randomised trials or syntheses of these) and tend to be specific to a single health-problem (e.g. asthma, diabetes or low back pain).

In contrast, the osteopathic profession has tended to opt for a more fundamental set of principles, which are intended to be true for all health problems, across all people, under all circumstances, for all time. This is a laudable, hugely ambitious epistemological challenge, which would ideally require the continued aggregation and synthesis of all knowledge of the human body. As this is virtually impossible and because future knowledge cannot be entirely predicted, each principle must be considered a hypothesis that gradually advances closer to the truth as knowledge grows. Accordingly, the first consensus-borne principles (published in 1922)[2] have twice been revised (latterly in 2002) in order to be more closely aligned with current knowledge.

A brief history of osteopathic principles

Andrew Taylor Still, the founder of osteopathy, never wrote a set or list of principles. Instead, he wrote several texts on health, disease and his philosophical stance on both, replete with religious overtones. As a result, several attempts have been made to summarise Still's mostly confusing, sometimes impenetrable and usually contradictory writing (Table 1).

The first consensus-driven attempt to summarise Still's osteopathic concept was in 1922. The authors had the insight to write their findings in the form of

Table 1 The three consensus borne 'sets' of osteopathic principles.

1922 principles[2]	1953 principles[3]	2002 principles[4]
The osteopathic view of the cell, whether as a unit or as one of the millions making up the human body, is largely covered by the following statements: 1. *Normal structure is essential to normal function* 2. *Normal function is essential if normal structure is to be maintained* 3. *Normal environment is essential to normal function and structure, though some degree of adaptation is possible for a time, even under abnormal conditions* In the human body, with its diversified functions, we may add also, 4. *The blood preserves and defends the cells of the body* 5. *The nervous system unifies the body in its activities* 6. *Disease symptoms are due either to failure of the organism to meet adverse circumstances efficiently, or to structural abnormalities* 7. *Rational methods of treatment are based upon an attempt to provide normal nutrition, innervations and drainage to all tissues of the body, and these depend chiefly upon the maintenance of normal structural relations*	1. *The body is a unit* 2. *The body possesses self-regulatory mechanisms* 3. *Structure and function are reciprocally interrelated* 4. *Rational therapy is based on an understanding of body unity, self-regulatory mechanisms, and the interrelationship of structure and function*	Revised tenets of osteopathic medicine 1. *A person is the product of dynamic interaction between body, mind, and spirit* 2. *An inherent property of this dynamic interaction is the capacity of the individual for the maintenance of health and recovery from disease* 3. *Many forces, both intrinsic and extrinsic to the person, can challenge this inherent capacity and contribute to the onset of illness* 4. *The musculoskeletal system significantly influences the individual's ability to restore this inherent capacity and therefore to resist disease processes* Revised principles for patient care 5. *The patient is the focus for healthcare* 6. *The patient has the primary responsibility for his or her health* 7. *An effective treatment program for patient care is founded on these tenets*

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bullet-point statements or principles, which were easier to digest than the sprawling, unpunctuated paragraphs of Still's texts. The seven principles that were synthesised weren't disseminated in a peer-reviewed journal, but instead were published in a re-edition of an osteopathic textbook of the time.[2] Three of these principles referred to the physiology and health of the human body, and a single statement served as guidance for clinicians; a trend that was continued throughout future revisions.

In 1953, a "Special Committee on Osteopathic Principles and Osteopathic Technic" at Kirksville College of Osteopathy and Surgery revised the 1922 set and created "four general principles from which are derived an etiological concept, a philosophy and a therapeutic technic that are distinctive." As in 1922, three statements related to the physiology and health, with a single statement (summarising the others) to guide clinicians.[3]

Finally, in 2002 a committee was formed to revise the 1953 set of principles, and more closely align them to contemporary knowledge.[4] Once again, these consisted of statements relating to physiology and health (four principles), with the remainder (three) relating to the care of patients. When comparing the progression of these principles (Table 1), one can identify themes that are latent across the three sets. The precise wording around each theme has changed, sometimes markedly, over the years and allows for a historical discussion of these themes, as below.

The osteopathic view: E pluribus unum

The 1922 set of osteopathic principles began with a noteworthy declaration[2]:

The osteopathic view of the cell, whether as a unit or as one of the millions making up the human body, is largely covered by the following statements:

1. *Normal structure is essential to normal function.*
2. *Normal function is essential if normal structure is to be maintained.*
3. *Normal environment is essential to normal function and structure, though some degree of adaptation is possible for a time, even under abnormal conditions.*

Perhaps because of the major biological discoveries of the time, emphasis was given to the physiology of the human cell, and structure—function relationships feature heavily amongst these. Three further statements considered the body as a whole. Nonetheless, there was evidently a place for reductionist thinking amongst osteopathic philosophy in the early twentieth century.

The body is a unit (1953)

The first principle from the 1953 set of principles[3] is often interpreted as advocating holism; a unified, whole organism viewpoint. Holism contrasts with classical Cartesian dualism, which holds that mind and matter (the body) are two ontologically separate entities. The 1953 authors defined 'the body' rather than 'the person' as the unit of totality, clearly excluding the mind from that unit. Hence, this statement is dualistic, perhaps reflecting the importance given to putative effects of biomechanics upon health by osteopaths of the latter twentieth century.[5,6]

A person is the product of dynamic interaction between body, mind, and spirit (2002)

The dualistic division of body and mind was somewhat remedied in the 2002 revision of osteopathic principles. This perhaps reflected the growing research-based movement towards the introduction of a 'biopsychosocial' approach to healthcare.[7] A biopsychosocial model shares many of the features of holism, acknowledging the multidimensional nature of health and the multitude of factors that influence it, but provides a more formal structural blueprint for clinicians, with defined social and psychological constructs known to interact with biological mechanisms and physical impairments.[8]

The authors of the 2002 principles took a further step than was taken in 1953. Instead of simply choosing to state that *a person is a unit*, they attempted to define what constitutes a person. This might have been a trap worthy of avoiding, as in attempting to be collectively exhaustive in their definition, they did not provide for any effects of the environment in which the person exists, the relationship of that person with that environment through their special and general senses, diet, lifestyle, schema, values, self-perceived identity, and relationships with others. Every one of these varies through the course of a person's lifetime and all are known to influence health. Instead, the authors chose to include the term 'spirit', which has quasi-religious connotations. Andrew Taylor Still may have been pleased with the inclusion of this, but those of a more secular persuasion most likely are not.

Homeostasis and immunity

The blood preserves and defends the cells of the body (1922)

This statement alludes rather crudely to the functions of the immune system. Some leeway must be given to the terminology used (i.e. blood) due to the period in which it was written. However, the germ theory of disease was well developed by the early

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twentieth century and the basic mechanisms of humoral immunity had been discovered, so both should have informed this statement. The most obvious flaw in this statement is the assumption that actions of the immune system are always beneficial to the cells of the host, let alone their health. Anybody with an autoimmune condition would likely take issue with this.

There is a further omission from the functions of the immune system that contradicts the above statement. That is the involvement of the immune system in the phenomenon of programmed cell death, known as apoptosis.[9–11] Amongst other tasks, apoptosis is used to prevent uncontrolled division of potential 'rogue' cells, and so avert cancer. The basic concept of apoptosis was discovered in the mid-nineteenth century but was not greatly developed until the mid-twentieth century, much later than 1922. Apoptosis is clear evidence that the immune system primarily protects the organism and ultimately its valuable genes, rather than individual cells, which are expended when necessary. Hence, a more careful reworking of this statement was required.

The body possesses self-regulatory mechanisms (1953)

It would take a very liberal interpretation of this statement to sufficiently cover the functions of the immune system; a major omission from the 1953 set of osteopathic principles. Instead, this statement alludes to homeostasis, which is the property of a system (usually an organism) whereby the internal environment is actively regulated to lie at a stable, optimal level to promote survival. The concept has been updated (remaining consistent with the above principle) and given the term 'allostasis'.[12] Allostasis emphasises that optimal conditions for survival should not be considered to lie at a single level, but within a range of possible levels that depend on the immediate needs of the organism. The concept also emphasises a simultaneous, coordinated response through several mechanisms to maintain or return the internal (and through behaviour, external) environment as close as possible to optimal levels.

An inherent property of this dynamic interaction is the capacity of the individual for the maintenance of health and recovery from disease (2002)

Again, reference is made to homeostasis/allostasis, and this time immunity is sensibly included. However, the wording of this principle assumes that a 'capacity' for homeostasis/allostasis and immunity is at all times 'inherent'. This assumption, of course, overlooks conditions where these systems have themselves failed or are inoperable from birth. A person will certainly be in poor health if they cannot perform the required homeostatic/allostatic adjustments that active life demands (e.g. diabetes), or if the immune system is unable to defend the tissues from pathogens (e.g. AIDS) and rogue cells that may become cancerous, or has even left the patient in the limbo of continuing malaise and fatigue that may result from an oversensitive neuro-immune network (e.g. fibromyalgia or chronic fatigue syndrome). As such, perhaps this principle could have been better worded as '*Under optimal conditions, this dynamic interaction possesses an inherent capacity for the maintenance of health and recovery from disease*'. This might even focus clinicians towards attempting to restore these 'optimal conditions'.

Hierarchy of body systems

The nervous system unifies the body in its activities (1922)

This statement is interesting not only because it recognises the primacy of the nervous system, and in doing so establishes a hierarchy of body systems, but also as it is omitted from all future versions of osteopathic principles (Table 1). The use of the term 'activities' is also an interesting choice as it can be interpreted as referring to both internal physiological processes and external behaviour. Even with today's incomparably greater knowledge of the nervous system, little can be said against the validity of this statement.

The musculoskeletal system significantly influences the individual's ability to restore this inherent capacity and therefore to resist disease processes (2002)

New to the 2002 set of osteopathic principles is this statement giving ascendancy to the role of the musculoskeletal system in health and disease, in line with the writings of Irvin Korr,[13] a member of the 2002 panel.[4] Again, this suggests a hierarchy of body systems within osteopathic philosophy, and contrasts to the primacy of the nervous system emphasised in 1922 (and not mentioned since). The statement gives firm footing for the use of physical treatments and exercise to promote health, both common interventions employed in osteopathic healthcare throughout the world. It also acknowledges the important metabolic processes occurring within the musculoskeletal system. However, whether replacing the term 'musculoskeletal' with 'nervous' (as in 1922), 'endocrine', 'immune', 'cardiovascular', 'respiratory', or 'digestive' is any less valid is another question. Perhaps simply

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stating that *adverse conditions in any one system will have consequences in all other systems* would suffice.

Structure—function relationships

Disease symptoms are due either to failure of the organism to meet adverse circumstances efficiently, or to structural abnormalities (1922)

Without entering into the semantics of the aetiological difference between diseases and their symptoms, this statement posits that diseases will manifest under only two circumstances; failure to meet adverse circumstances (e.g. through homeostasis/allostasis or in response to infection) or structural abnormalities. This list is at best incomplete, even when interpreted liberally, as will be discussed later.

Structure and function are reciprocally interrelated (1953)

It is always extreme cases that most rigorously test a theory. Sometimes, such a case highlights the deficiency of a theory to the extent that no amount of tweaking will suffice. Only a Khunian 'paradigm shift'[14] will do. For structure—function relationships, one such conquering case is pain. This principle (irrespective of how loosely it is interpreted: biomechanics, ergonomics, neural plasticity, etc.) is simply inadequate for clinicians dealing with pain in all its guises. Furthermore, unquestioning adherence to such a principle has the potential to harm those experiencing pain by compounding disability.[15,16] or providing for inappropriate interventions.[17] To highlight this deficiency, a brief summary of essential pain biology is required.

Firstly, pain is not simply a sensory correlate to the physical state of the body tissues (a two-stage procedure). Instead, it is an unpleasant, multidimensional experience,[18] produced by a highly evolved 'threat detection' system,[19] that operates through a minimum of three stages: input-process-output.[20] Indeed, pain is just one of several 'outputs' from the brain, which include perceptual, emotional, immuno-endocrine, and behavioural responses, each of which corresponds with a unique 'neurosignature'.[21,22]

A subtle but crucial consequence of this is that the brain effectively chooses to create the conscious experience of pain. Pain is therefore distinct from nociception; the activity in the nervous system involving the encoding and processing of noxious stimuli, which is evoked by tissue injury, inflammation, or other pathology.[23] Indeed, our tissues are in constant communication with our CNS and at any time, some of our tissues will be sending barrages of nociception to the brain. It is therefore remarkable that we are not in pain more often — the brain effectively filters out nociceptive 'noise'. When we *do* experience pain, it is because the brain has decided that we might benefit from it (a useful or 'adaptive' pain response) encouraging us to change our behaviour or environment accordingly. Crucially, this 'neuromatrix' model[21,22] liberates the brain from the reliance on sensory input. Accordingly, the characteristic 'neurosignature' that produces pain may be triggered by somatic sensory inputs, such as tissue injury, but may also be generated independently of them, such as in the presence of central sensitization,[24] very high levels of stress such as in complex regional pain syndrome,[25] or even the observation of pain in others.[26]

Not every pain is useful. Indeed, sometimes the threat detection system is too cautious, oversensitive, or simply goes awry, and a maladaptive pain ensues. Mal-adaptive pains appear regularly in the clinics of osteopaths. Although relatively uncommon, 'phantom limb' pain is one such case and no example demolishes the principle of structure—function interdependence more emphatically than "pain in fresh air".[19] Between 50% and 80% of amputees experience a painful 'phantom' in their lost limb.[27] It is not just an arm or leg that can be a phantom. Phantoms of a breast, penis, tongue or other innervated body part have been reported.[28] It occurs primarily because of a mismatch between the reality of the tissues in the body and their corresponding spatial representation (or 'map') in the somatosensory cortex of the brain.[29,30] Almost more incredible than the phenomenon of painful phantoms themselves are some of the ways that they can be managed. Stimuli of special sense organs have been shown to reduce or obliterate phantom limbs by decreasing the incongruence between the limb tissues and the cortical representation of them. In particular, stimulating the visual cortex using mirrors[31] or even just imagining movement of the absent limb, known as motor imagery,[32] has been a useful tool to tackle the problem. This approach exploits the brains predilection for prioritising visual inputs over proprioceptive feedback concerning limb position.[33] Furthermore, stimulating the vestibular apparatus, through syringing cold water into the ear canal, has been shown to provide short term relief of painful phantoms.[34,35]

Phantom limb pain is probably the clearest example where structure—function relationships fail to explain the biological processes of pain, but it is by no means alone. Almost all types of

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neuropathic pain, central sensitization, the relationship between disability and psychosocial factors, illness behaviour, and the mechanism of action of many physical treatments all serve as good examples where a structure—function approach fails to serve as a satisfactory theoretical model. In the author's opinion, the osteopathic profession would do well to rid itself of this obsolete principle that promotes an unhealthy search for structural explanations and correlates for every deviation from normal function. Such a change may already be in motion as notably absent from the 2002 set of principles is any statement referring to structure—function relationships. This is an unmistakeable u-turn when compared to the statements of the 1922 and 1953 sets, and a change that immediately makes the 2002 set of principles less distant from the truth, and as such, more appealing.

Evolution: the missing link?

Many recognised diseases are inherited from parents. Indeed, phenotypic traits contribute to adverse health states even when there is not a recognisable disease present. The molecular units of heritability are, of course, genes and the structure of DNA was first published in 1953[36]; coincidently the same year as the osteopathic principles were revised in Kirksville some eighty years after the founding of osteopathy. It is, perhaps, of little surprise then that there is no reference to heritability in the 1922 or 1953 principles. Moreover, osteopathic principles are ultimately based on biology and the scientific foundation of all biology is evolution. After all, "nothing in biology makes sense except in the light of evolution".[37] Darwin's work was published in 1859 but a century would pass before the first applications of evolutionary reasoning (as distinct from genetics) were applied to understand common health issues.[38] Even so, it is surprising that by 2002 evolution has yet to make an obvious impression upon osteopathic principles.

In a nutshell, evolutionary (or Darwinian) medicine recognises that all biological traits require two complementary explanations; proximate and evolutionary.[39] The proximate explanation describes what is wrong in the bodily mechanism of an individual at the present time. In comparison, an evolutionary explanation provides the reasons why traits that give rise to health vulnerabilities exist in the population. The insight provided by recognition of the dichotomy of proximate and evolutionary explanations for health problems is profound. Indeed, it gives a context and lineage for the whole-organism view of health, beyond simple mind-body unity. Using evolutionary reasoning, many symptoms and signs can be seen in their true light as 'defensive' inherited mechanisms that protect the organism and ultimately aid successful reproduction of its genes (Table 2).

Many osteopaths will have previously recognised the potential benefit of these short-term defensive bodily reactions. Even so, the unpleasant nature of these reactions often leads individuals (not to mention clinicians and the pharmaceutical industry) to seek remedies to suppress them. To be fair though, it is important to note that each of these comes at a cost, and the body does not always successfully regulate these mechanisms and might at times benefit from carefully applied intervention. Even so, appreciating the 'defensive' origins of these symptoms is useful when planning the suitability and timeliness of care for the patient.

Less obvious than these defensive adaptations is the continued existence of other heritable characteristics whose benefits may now be obsolete, but can still cause ill health. Some adaptations only confer advantage when under the circumstances in which they evolved, and these may be very different to the lifestyles and environments of today.[39] Circumstances such as the ready availability of

Table 2 'Unpleasant' human adaptations that confer advantages.[a]

Symptom	Advantage
Fever	Increased temperature increases the body's ability to combat infection
Pain	Brings a threatful situation to the attention of the person so that defensive or avoidant action can take place[21,22,40]
Anxiety	Prepares the body for an efficient 'fight or flight' response to reduce danger and promote escape
Depression	Low mood and lethargy inhibit actions that may be futile and therefore a waste of limited resources[41]
Expulsions	Sneezing, coughing, vomiting and diarrhoea can rapidly expel pathogens
Morning sickness	Nausea and food aversions during early pregnancy impose dietary restrictions to protect the developing embryo/foetus from exposure to toxins and pathogens[42]

[a] Based on Nesse & Williams[39] unless otherwise stated.

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former rarities as fatty and sugary foods are recent enough that natural selection has yet to deal with them in the quantities now being consumed.[43] Unfortunately, eating these foods does not appear to be any less pleasurable once we are obese. Hence, the current pandemic of obesity and its accompanying non-communicable diseases.[44]

Unlike many of Still's assertions, the human body is not perfect in 'design'. There are numerous flaws and these expose humans to certain problems. Examples of how natural selection has shaped us imperfectly are: shared passageways for swallowing food and inhaling air that provides a risk for choking and asphyxiation, excessively long and tortuous routes taken by nerves (e.g. recurrent laryngeal) that are energy-expensive and delay communication of information, the blind spot of the human eye that increases the likelihood of predation and injury, and the close proximity of spinal nerve roots with axially weight-bearing intervertebral discs that typically deform within a human lifetime. Most of these flaws can be explained by path dependence; the inability to return the design of the organism 'to the drawing board'. Evolution unfortunately allows adaptations in just one direction, following on from what is already present, and that will inevitably lead to compromise.

The future?

The behavioural trends of clinicians belonging to a profession, including the interventions and diagnostic techniques that they employ, gradually change over time. Some individual clinicians are happy to change their behaviour during their careers, as their knowledge of existing clinical approaches grows or as they embrace new developments and technology. Many clinicians, however, will never change from the day they graduate, so that their days practicing must be seen out for the profession as a whole to progress. As the German physicist, Max Planck, said, "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it."[45] The behaviour of clinicians is therefore not the appropriate index to define the essence of their profession. On the other hand, elementary principles have the potential to fulfil this role, if they are achievable.

Osteopathic principles are clearly a 'work in progress'. They are certainly not perfect in their current form but they appear to be improving over time; the 2002 set of principles is, on the whole, an improvement on the 1922 and 1953 sets. The necessity for revision has always been the advancement of knowledge of health and biology. Thus, the appropriate way to perform these revisions is to use the scientific method, and to consider each principle as a hypothesis that must be tested. As always, the requirement for failure is just one counter-example or single case that cannot be explained sufficiently, such as those given above.

The statements composing the 2002 set of osteopathic principles are not collectively exhaustive in summarising the fundamental requirements for health. Thus, before these statements are revised, efforts should be made to first identify broad areas of importance that provide adequate coverage. Upon revision, a statement can leave some room for improvement but should not require a complete reversal in the future. Consequently, statements should only be formed when such a 'critical mass' of knowledge has been accrued that confidence may be placed in the underlying principle. This strategy might avoid costly u-turns that could undermine the potential value of osteopathic principles and might well lead to poor decisions and care in the interim. Not to mention that there will be a whole generation of osteopaths out in the field, preaching and teaching the wrong version of the 'truth', which could take many years to reverse.

On the other hand, should the osteopathic profession manage to achieve the ultimate goal — to enshrine a set of eternal truths within a list of principles — then they also have to live with the probable consequences, which will be uncomfortable for some. Other professional groups will surely adopt their principles for they will offer an irresistible, invaluable tool. Osteopathy will have then achieved its ultimate goal, and simultaneously begun the erosion of its uniqueness. Perhaps this was Andrew Taylor Still's vision in the first place — a lasting legacy that changed the world of healthcare. After all, if every clinician is following the same principles, what's in a name?

Author contribution

I am the sole author of this work.

Statement of competing interests

David Evans is the Masterclass Section Editor for the International Journal of Osteopathic Medicine and a member of the Editorial Board but was not involved in review or editorial decisions regarding this manuscript.

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